[0031] According to certain embodiments, this kind of map information or at least part of the information could also be provided in association with navigation maps, such as Nokia™ HERE maps and services. This could be an especially attractive offering for novel or local and small operators and for novel frequency bands where this information would be especially valuable.

[0032] In one embodiment, the network may select different portions of the spectrum for the purpose of creating the performance maps. This selection may be based, for example, on radio propagation characteristics, pathloss exponents, LOS requirements, oxygen and water absorption characteristics, and penetration characteristics.

[0033] In another embodiment, the network or UE may transmit signals such as pilots, beacons, or synchronization signals for measurement in different portions of the spectrum. Alternately, wideband signals covering the entire spectrum of interest can be used. In yet another embodiment, the network or UE may make measurements in a portion of the spectrum by simply listening to ongoing transmissions in that portion of the spectrum.

[0034] According to another embodiment, the network may use measurements in one portion of the spectrum to estimate the performance in another portion of the spectrum. This may be done, for example, through adjusting and applying different pathloss exponents to measurements from one portion of the spectrum.

[0035] In another embodiment, the network may adjust the performance maps based on expected environmental changes such as weather conditions (e.g., rain or snow) and vehicular and pedestrian traffic density (e.g., rush hour, train arrival, etc.). In yet another embodiment, the network may adjust the performance maps based on spectrum usage by the network. That is, as spectrum is dynamically allocated by the network, the maps may be adjusted to reflect this usage including bandwidth availability, interference, and load.

[0036] FIG. **2** illustrates an example of an apparatus **20** according to an embodiment. In an embodiment, apparatus **20** may be a base station in a communications network, such as a base station in a wideband radio system. It should be noted that one of ordinary skill in the art would understand that apparatus **20** may include components or features not shown in FIG. **2**. Only those components or features necessary for illustration of the invention are depicted in FIG. **2**.

[0037] As illustrated in FIG. **2**, apparatus **20** includes a processor **32** for processing information and executing instructions or operations. Processor **32** may be any type of general or specific purpose processor. While a single processor **32** is shown in FIG. **2**, multiple processors may be utilized according to other embodiments. In fact, processor **32** may include one or more of general-purpose computers, special purpose computers, microprocessors, digital signal processors (DSPs), field-programmable gate arrays (FPGAs), application-specific integrated circuits (ASICs), and processors based on a multi-core processor architecture, as examples.

[0038] Apparatus **20** further includes a memory **34**, which may be coupled to processor **32**, for storing information and instructions that may be executed by processor **32**. Memory **34** may be one or more memories and of any type suitable to the local application environment, and may be implemented using any suitable volatile or nonvolatile data storage technology such as a semiconductor-based memory device, a magnetic memory device and system, an optical memory device and system, fixed memory, and removable memory. For example, memory **34** can be comprised of any combination of random access memory (RAM), read only memory (ROM), static storage such as a magnetic or optical disk, or any other type of non-transitory machine or computer readable media. The instructions stored in memory **34** may include program instructions or computer program code that, when executed by processor **32**, enable the apparatus **20** to perform tasks as described herein.

[0039] Apparatus **20** may also include one or more antennas **35** for transmitting and receiving signals and/or data to and from apparatus **20**. Apparatus **20** may further include a transceiver **38** configured to transmit and receive information. For instance, transceiver **38** may be configured to modulate information on to a carrier waveform for transmission by the antenna(s) **35** and demodulate information received via the antenna(s) **35** for further processing by other elements of apparatus **20**. In other embodiments, transceiver **38** may be capable of transmitting and receiving signals or data directly.

[0040] Processor **32** may perform functions associated with the operation of apparatus **20** including, without limitation, precoding of antenna gain/phase parameters, encoding and decoding of individual bits forming a communication message, formatting of information, and overall control of the apparatus **20**, including processes related to management of communication resources.

[0041] In an embodiment, memory **34** stores software modules that provide functionality when executed by processor **32**. The modules may include, for example, an operating system that provides operating system functionality for apparatus **20**. The memory may also store one or more functional modules, such as an application or program, to provide additional functionality for apparatus **20**. The components of apparatus **20** may be implemented in hardware, or as any suitable combination of hardware and software.

[0042] As mentioned above, according to one embodiment, apparatus **20** may be a base station in a communications network, such as a base station in a 5G radio system. In this embodiment, apparatus **20** may be controlled by memory **34** and processor **32** to create performance maps for different portions of the spectrum in a wideband radio system. In an embodiment, performance may be measured via RSRP/RSRQ, SINR, SE, or throughput. Some of these parameters are technology dependent and may thus be recorded in association to a certain technology. The performance maps may include information regarding terrain, surroundings (e.g., trees, lamp posts, etc.), buildings, weather, foliage, load metric, etc. These performance maps may be semi-static (i.e., slow changing for example in order of hours). In an embodiment, the performance maps can be generated and refined using existing feedback from UEs, such as CQI, RSRP/RSRQ.

[0043] For access, in an embodiment, apparatus **20** may be controlled by memory **34** and processor **32** to take the semi-static performance maps and combine them with dynamic information such as available bandwidth from sensing and user specific information (e.g., location, speed, and direction). Based on the information, apparatus **20** may be controlled by memory **34** and processor **32** to select a portion or portions of the spectrum to be used for access. The use of a performance map combined with other dynamic information has an advantage of providing stable wireless connectivity at the expected quality (e.g., throughput, SINR).

[0044] FIG. **3** illustrates an example of a flow diagram of a method, according to one embodiment. In some embodi-